

The documentation and process conversion measures necessary to comply with this revision shall be completed by 24 January 2021.

INCH-POUND

MIL-PRF-19500/673C
w/AMENDMENT 4
22 October 2021
SUPERSEDING
MIL-PRF-19500/673C
w/AMENDMENT 3
27 January 2020

PERFORMANCE SPECIFICATION SHEET

TRANSISTOR, FIELD EFFECT, RADIATION HARDENED N-CHANNEL, SILICON,
ENCAPSULATED (SURFACE MOUNT AND CARRIER BOARD PACKAGES), TYPES 2N7468 AND 2N7469
JANTXVR, F, G AND H AND JANSR, F, G AND H

This specification is approved for use by all Departments and Agencies of the Department of Defense.

The requirements for acquiring the product described herein shall consist of this specification sheet and [MIL-PRF-19500](#).

1. SCOPE

1.1 Scope. This specification covers the performance requirements for an N-channel, enhancement-mode, MOSFET, radiation hardened (total dose and single event effects (SEE)), power transistor. Two levels of product assurance (JANTXV and JANS) are provided for each encapsulated device, with avalanche energy maximum rating (E_{AS}) and maximum avalanche current (I_{AS}). Provisions for radiation hardness assurance (RHA) to four radiation levels ("R", "F", "G" and "H") are provided for JANS and JANTXV product assurance levels.

1.2 Package outlines. The device package outlines are as follows: TO-276AC in accordance with [figure 1](#), TO-276AC with lead option (U2L) in accordance with [figure 2](#), TO-276AC with carrier board option (U2S) in accordance with [figure 3](#), and surface mount (U2A) in accordance with [figure 4](#) for all encapsulated device types.

1.3 Maximum ratings. T_A = +25°C, unless otherwise specified.

Type (1)	P _T (2) T _C = +25°C	P _T (2) T _A = +25°C	R _{θJC} (3)	R _{θJ} Carrier U2S	R _{θJ} Lid U2L (4)	V _{DS}	V _{DG}	V _{GS}	I _{D1} (5) (6) T _C = +25°C	I _{D2} (5) (6) T _C = +100°C	I _S	I _{DM} (5)	T _J and T _{STG}
	<u>W</u>	<u>W</u>	<u>°C/W</u>	<u>°C/W</u>	<u>°C/W</u>	<u>V dc</u>	<u>V dc</u>	<u>V dc</u>	<u>A dc</u>	<u>A dc</u>	<u>A dc</u>	<u>A (pk)</u>	<u>°C</u>
2N7468U2	250	2.5	0.50	1.50	10	60	60	±20	75	75	75	300	-55 to
2N7469U2	250	2.5	0.50	1.50	10	100	100	±20	75	69	75	300	+150

- (1) Electrical characteristics for the "U2A", "U2L", and "U2S" suffix devices are identical to the "U2" suffix devices unless otherwise noted.
- (2) Derate linearly 2.0 W/°C for T_C > +25°C.
- (3) See [figure 5](#) thermal response curves.
- (4) The Thermal resistance is applicable for mounting methods where a heatsink is attached to the lid for "U2L" suffix devices.
- (5) The following formula derives the maximum theoretical I_D limit. I_D is limited by package design:

$$I_D = \sqrt{\frac{T_{JM} - T_C}{(R_{\theta JC}) \times (R_{DS(on)} \text{ at } T_{JM})}}$$

- (6) See [figure 6](#) for maximum drain current graphs.

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1.4 Primary electrical characteristics at $T_C = +25^\circ\text{C}$.

Type (1)	Min $V_{(BR)DSS}$ $V_{GS} = 0$ $I_D = 1.0\text{mA}$ dc	$V_{GS(TH)1}$ $V_{DS} \geq V_{GS}$ $I_D = 1.0\text{ mA}$ dc	Max I_{DSS1} $V_{GS} = 0$ $V_{DS} = 80$ percent of rated V_{DS}	Max $r_{DS(on)}$ (2) $V_{GS} = 12\text{ V}$, $I_D = I_{D2}$		E_{AS}	
				$T_J = +25^\circ\text{C}$	$T_J = +150^\circ\text{C}$		
	<u>V dc</u>	<u>V dc</u> Min Max		<u>$\mu\text{A dc}$</u>	<u>Ω</u>	<u>Ω</u>	<u>mJ</u>
2N7468U2	60	2.0	4.0	10	0.0056	0.0125	500
2N7469U2	100	2.0	4.0	10	0.012	0.021	363

- (1) Electrical characteristics for the "U2A", "U2L", and "U2S" suffix devices are identical to the non-suffix devices unless otherwise noted.
(2) Pulsed (see 4.5.1).

1.5 Part or Identifying Number (PIN). The PIN is in accordance with MIL-PRF-19500, and as specified herein. See 6.4 for PIN construction example and 6.5 for a list of available PINs.

1.5.1 JAN certification mark and quality level for encapsulated devices. The quality level designators for encapsulated devices that are applicable for this specification sheet from the lowest to the highest level are as follows: "JANTXV" and "JANS".

1.5.2 Radiation hardness assurance (RHA) designator. The RHA levels that are applicable for this specification sheet from lowest to highest are as follows: "R", "F", "G", and "H".

1.5.3 Device type. The designation system for the device types of transistors covered by this specification sheet are as follows.

1.5.3.1 First number and first letter symbols. The transistors of this specification sheet use the first number and letter symbols "2N".

1.5.3.2 Second number symbols. The second number symbols for the transistors covered by this specification sheet are as follows: "7468" and "7469".

1.5.3.3 Suffix letters. The suffix letters "U2" are used on devices that are packaged in the TO-276AC package of figure 1. The suffix letters "U2L" are used on devices that are packaged in the SMD2 TO-276AC package and have additional flat leads added, see figure 2. The suffix letters "U2S" are used on devices that are packaged in the SMD2 TO-276AC package mounted to a carrier board, see figure 3. The suffix letters "U2A" are used on devices that are packaged in the surface mount package of figure 4.

1.5.4 Lead finish. The lead finishes applicable to this specification sheet are listed on QPDSIS-19500.

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* 1.6 Radiation features:

Maximum total ionizing dose (TID) available (Dose rate = 50-300 rad(Si)/s):

- For device types 2N7469 (U2A): 1 Mrads(Si) 1/
- For device types 2N7469 (U2): 500 krads(Si) 1/
- For device types 2N7468 (U2, U2A): 300 krads(Si) 1/

Heavy Ion Single Event Effect (SEE) SEB and SEGR test:

For device type 2N7468 (U2, U2A, U2L, U2S):

- No SEB and SEGR were observed at surface LET (see table V) $\leq 84 \text{ MeV}\cdot\text{cm}^2/\text{mg}$ 2/
- (In-situ Bias $V_{DS} = 35 \text{ V}$ and $V_{GS} = 0 \text{ V}$)
- (In-situ Bias $V_{DS} = 30 \text{ V}$ and $V_{GS} = -5 \text{ V}$)
- (In-situ Bias $V_{DS} = 25 \text{ V}$ and $V_{GS} = -10 \text{ V}$)
- (In-situ Bias $V_{DS} = 20 \text{ V}$ and $V_{GS} = -15 \text{ V}$)
- (In-situ Bias $V_{DS} = 14 \text{ V}$ and $V_{GS} = -20 \text{ V}$)

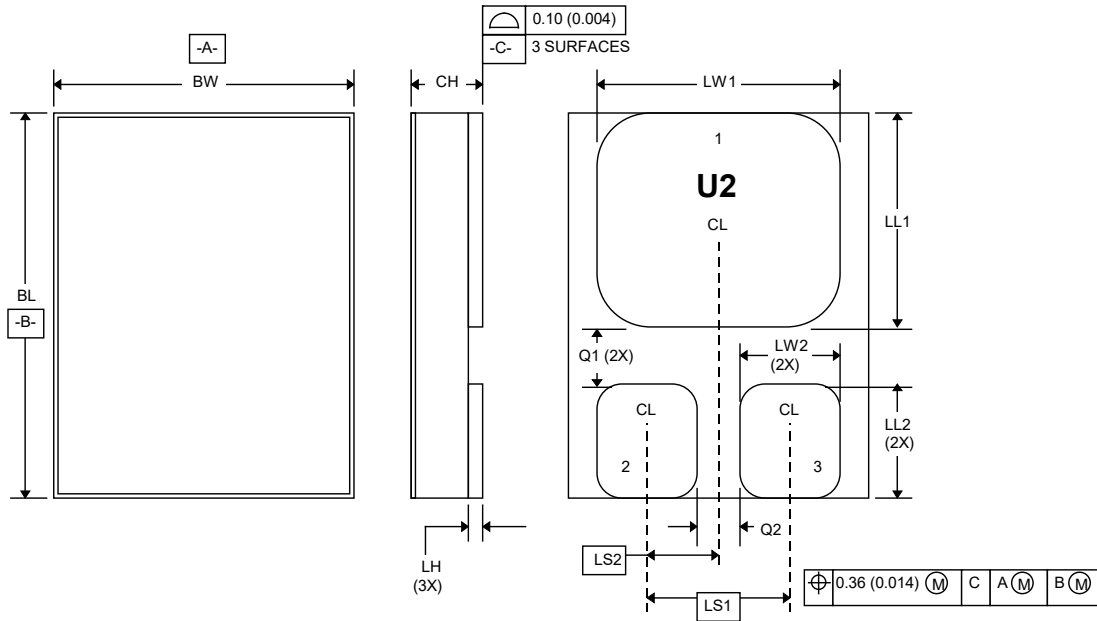
For device type 2N7469 (U2, U2A, U2L, U2S):

- No SEB and SEGR were observed at surface LET (see table V) $\leq 84 \text{ MeV}\cdot\text{cm}^2/\text{mg}$ 2/
- (In-situ Bias $V_{DS} = 100 \text{ V}$ and $V_{GS} = -5 \text{ V}$)
- (In-situ Bias $V_{DS} = 80 \text{ V}$ and $V_{GS} = -10 \text{ V}$)
- (In-situ Bias $V_{DS} = 25 \text{ V}$ and $V_{GS} = -15 \text{ V}$)

1/ Manufacturer supplying device types 2N7549 and 2N7550 has performed characterization testing in accordance with MIL-STD-750, method 1019, condition A (dose rate = 50 - 300 rad(Si)/s). The radiation end point limits are guaranteed only for the conditions as specified in MIL-STD-750, method 1019, condition A to a maximum total ionizing dose level of 300 krads(Si), 500 krads(Si) and 1 Mrads(Si).

2/ Manufacturer also performed heavy ion SEB and SEGR test at Brookhaven National Lab Accelerator for the MOSFET technology devices in accordance with TM1080 of MIL-STD-750. Limits are characterized at initial qualification and after any design or process changes which may affect the SEE (SEB/SEGR) characteristics. For more information on SEE (SEB/SEGR) test results, customers are requested to contact the manufacturer.

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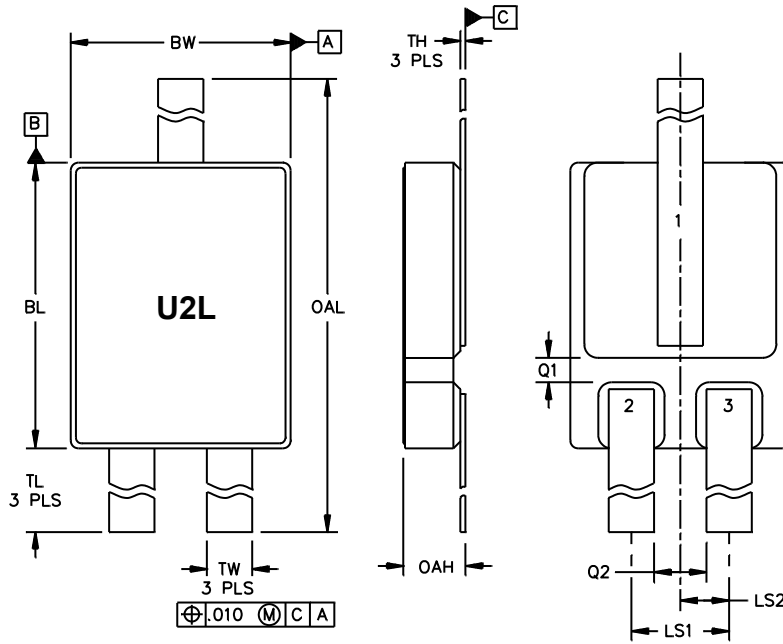
Symbol	Dimensions			
	Inches		Millimeters	
	Min	Max	Min	Max
BL	.685	.695	17.40	17.65
BW	.520	.530	13.21	13.46
CH		.142		3.61
LH	.010	.020	0.26	0.51
LW1	.435	.445	11.05	11.30
LW2	.135	.145	3.43	3.68
LL1	.470	.480	11.94	12.19
LL2	.152	.162	3.86	4.11
LS1	.240 BSC		6.10 BSC	
LS2	.120 BSC		3.05 BSC	
Q1	.035		0.89	
Q2	.050		1.27	
TERM 1	Drain			
TERM 2	Gate			
TERM 3	Source			

NOTES:

1. Dimensions are in inches.
2. Millimeters are given for information only.
3. The lid shall be electrically isolated from the drain, gate and source.
- * 4. In accordance with ASME Y14.5, diameters are equivalent to ϕ x symbology.

FIGURE 1. Dimensions and configuration (U2).

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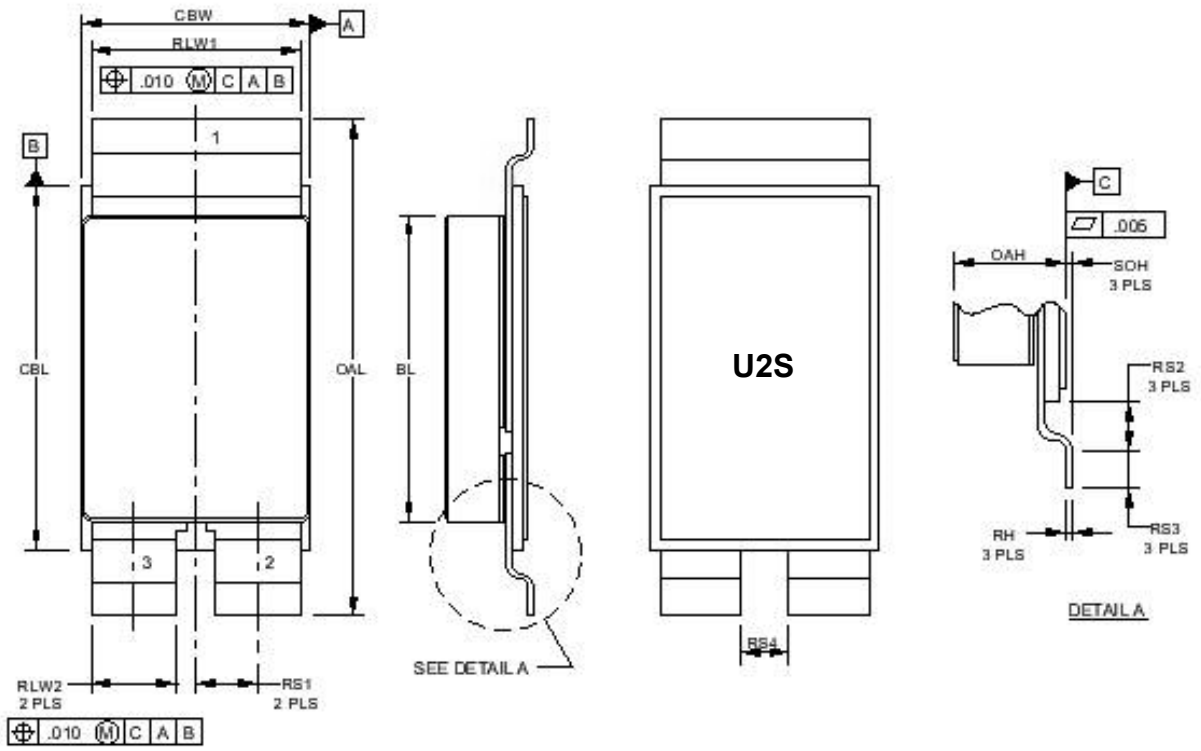
Symbol	Dimensions			
	Inches		Millimeters	
	Min	Max	Min	Max
BL	.685	.695	17.40	17.65
BW	.520	.530	13.21	13.46
LS1	.240 BSC		6.10 BSC	
LS2	.120 BSC		3.05 BSC	
Q1	.035		0.89	
Q2	.050		1.27	
TH	.005	.007	0.127	0.177
TL	.650	.675	16.52	17.14
TW	.095	.105	2.42	2.66
OAH		.150		3.81
OAL	1.985	2.045	50.42	51.94
TERM 1	Drain			
TERM 2	Gate			
TERM 3	Source			

NOTES:

1. Dimensions are in inches.
2. Millimeters are given for general information only.
3. The lid shall be electrically isolated from the drain, gate and source.
- * 4. In accordance with ASME Y14.5, diameters are equivalent to \varnothing x symbology.

FIGURE 2. Physical dimensions, U2 with leaded option (U2L).

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Symbol	Dimensions			
	Inches		Millimeters	
	Min	Max	Min	Max
BL	.685	.695	17.40	17.65
CBL	.825	.840	20.96	21.34
CBW	.520	.535	13.21	13.59
OAH	.174	.204	4.42	5.18
OAL	1.109	1.144	28.17	29.06
RH	.009	.015	0.23	0.38
RLW1	.473	.497	12.01	12.62
RLW2	.178	.202	4.52	5.13
RS1	.1475 BSC		3.75 BSC	
RS2	.142	.152	3.61	3.86
RS3	.040	.060	1.02	1.52
RS4	.093		2.36	
SOH	.005	.015	0.13	0.38
TERM 1	Drain			
TERM 2	Gate			
TERM 3	Source			

NOTES:

1. Dimensions are in inches.
2. Millimeters are given for general information only.
3. The lid shall be electrically isolated from the drain, gate and source.
- * 4. In accordance with ASME Y14.5, diameters are equivalent to ϕx symbology.

* FIGURE 3. Physical dimensions, U2 with carrier board option (U2S).

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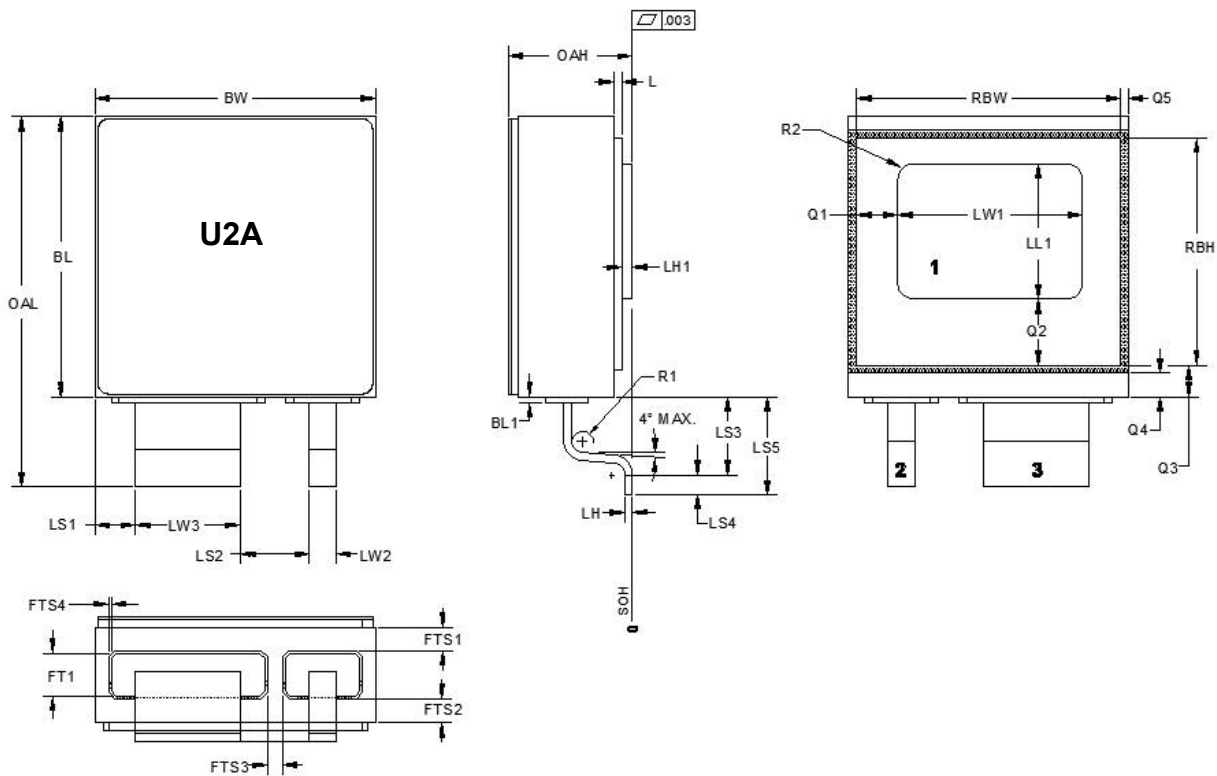


FIGURE 4. Physical dimensions, U2A surface mount.

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Symbol	Dimensions			
	Inches		Millimeters	
	Min	Max	Min	Max
BL	.524	.536	13.31	13.61
BL1	.005	.015	0.13	0.38
BW	.524	.536	13.31	13.61
FT1	.075	.085	1.91	2.16
FTS1	.036		0.91	
FTS2	.036		0.91	
FTS3	.030		0.76	
FTS4	.005 TYP		0.127 TYP	
L	.013	.017	0.33	0.43
LH	.013	.017	0.33	0.43
LH1	.02	.024	0.51	0.61
LL1	.25	.26	6.35	6.60
LS1	.07	.08	1.78	2.03
LS2	.125	.135	3.18	3.43
LS3	.125	.145	3.18	3.68
LS4	.040	.050	1.02	1.27
LS5	.170	.190	4.32	4.83
LW1	.345	.355	8.76	9.02
LW2	.045	.055	1.14	1.4
LW3	.195	.205	4.95	5.21
OAH		.26		6.60
OAL	.71 TYP		18.03 TYP	
Q1	.073	.083	1.85	2.11
Q2	.12	.13	3.05	3.30
Q3	.055	.065	1.40	1.65
Q4	.04		1.02	
Q5	.010	.020	.25	.51
RBH	.425	.435	10.8	11.05
RBW	.495	.505	12.57	12.83
R1	.02		0.51	
R2	.025	.035	0.635	0.889
TERM 1	Drain			
TERM 2	Gate			
TERM 3	Source			

NOTES:

1. Dimensions are in inches.
2. Millimeters are given for general information only.

FIGURE 4. Physical dimensions, U2A surface mount – continued

2. APPLICABLE DOCUMENTS

2.1 General. The documents listed in this section are specified in sections 3 and 4 of this specification. This section does not include documents cited in other sections of this specification or recommended for additional information or as examples. While every effort has been made to ensure the completeness of this list, document users are cautioned that they must meet all specified requirements of documents cited in sections 3 and 4 of this specification, whether or not they are listed.

2.2 Government documents.

2.2.1 Specifications, standards, and handbooks. The following specifications, standards, and handbooks form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.

DEPARTMENT OF DEFENSE SPECIFICATIONS

[MIL-PRF-19500](#) - Semiconductor Devices, General Specification for.

DEPARTMENT OF DEFENSE STANDARDS

[MIL-STD-750](#) - Test Methods for Semiconductor Devices.
[MIL-STD-883](#) - Test Method Standard Microcircuits

(Copies of these documents are available online at <https://quicksearch.dla.mil/>).

2.3 Order of precedence. Unless otherwise noted herein or in the contract, in the event of a conflict between the text of this document and the references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

3. REQUIREMENTS

3.1 General. The individual item requirements shall be as specified in [MIL-PRF-19500](#) and as modified herein.

3.2 Qualification. Devices furnished under this specification shall be products that are manufactured by a manufacturer authorized by the qualifying activity for listing on the applicable qualified manufacturer's list (QML) before contract award (see [4.2](#) and [6.3](#)).

3.3 Abbreviations, symbols, and definitions. Abbreviations, symbols, and definitions used herein shall be as specified in [MIL-PRF-19500](#) and as follows.

I_{AS} Rated avalanche current, nonrepetitive
nC nano Coulomb.

3.4 Interface and physical dimensions. The interface and physical dimensions shall be as specified in [MIL-PRF-19500](#) and on [figure 1](#), [figure 2](#) (U2L, surface mount TO-276AC with additional flat leads added) [figure 3](#) (U2S, surface mount TO-276AC with additional flat leads added and mounted to a carrier board), and [figure 4](#) (U2A surface mount) herein. Methods used for electrical isolation of the terminals shall employ materials that contain a minimum of 90 percent Al₂O₃ (ceramic).

3.4.1 Lead finish. Lead finish shall be solderable in accordance with [MIL-PRF-19500](#), [MIL-STD-750](#), and herein. Where a choice of lead finish is desired, it shall be specified in the acquisition document (see [6.2](#)).

3.4.2 Multiple chip construction. Multiple chip construction is not permitted to meet the requirements of this specification.

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3.4.3 Lead attach or carrier package. Alternations to the device shall be performed on devices that have passed all screening and QCI required per [MIL-PRF-19500](#) and listed herein. When leads or carrier attach is added to the U2 package, as a minimum, the vendor shall perform the tests specified in [4.3.4](#) herein.

3.4.4 Silicone die coat. The use of a silicone die coat requires a successful completion of [MIL-STD-883, method 5011](#) on each silicone lot for its intended applications, and as part of the full [MIL-PRF-19500](#) qualification process.

3.5 Marking. Marking shall be in accordance with [MIL-PRF-19500](#). At the option of the manufacturer, marking may be omitted from the body, but shall be retained on the initial container. Devices that have been altered with lead or carrier attached per the specification herein shall have the altered part number on the device or on the device packaging.

3.6 Electrostatic discharge sensitive (ESDS). The devices covered by this specification sheet have been classified as ESDS. The devices shall be handled in accordance with the ESD program established to comply with the requirements of [MIL-PRF-19500](#) to avoid damage due to the accumulation of static charge. The following handling practices shall be followed:

- a. Devices should be handled on benches with conductive handling devices.
- b. Ground test equipment, tools and personnel handling devices.
- c. Do not handle devices by the leads.
- d. Store devices in conductive foam or carriers.
- e. Avoid use of plastic, rubber or silk in MOS areas.
- f. Maintain relative humidity above 50 percent if practical.
- g. Care should be exercised during test and troubleshooting to apply not more than maximum rated voltage to any lead.
- h. Gate must be terminated to source, $R \leq 100 \text{ k}\Omega$, whenever bias voltage is applied drain to source.

3.7 Electrical performance characteristics. Unless otherwise specified herein, the electrical performance characteristics are as specified in [1.3](#), [1.4](#), and [table I](#).

3.8 Electrical test requirements. The electrical test requirements shall be as specified in [table I](#).

3.9 Workmanship. Semiconductor devices shall be processed in such a manner as to be uniform in quality and shall be free from other defects that will affect life, serviceability, or appearance.

4. VERIFICATION

4.1 Classification of inspections. The inspection requirements specified herein are classified as follows:

- a. Qualification inspection (see [4.2](#)).
- b. Screening (see [4.3](#)).
- c. Conformance inspection (see [4.4](#) and tables I and II).

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4.2 Qualification inspection. Qualification inspection shall be in accordance with [MIL-PRF-19500](#) and as specified herein.

4.2.1 Group E qualification. Group E inspection shall be performed for qualification or re-qualification only. In case qualification was awarded to a prior revision of the specification sheet that did not request the performance of [table III](#) (or [table IV](#), as applicable) tests, the tests specified in [table III](#) (or [table IV](#), as applicable) herein that were not performed in the prior revision shall be performed on the first inspection lot of this revision to maintain qualification.

* 4.2.1.1 Single event effects (SEE). SEE (SEB/SEGR) shall be performed in accordance with TM1080 of [MIL-STD-750](#) at initial qualification and after process or design changes which may affect radiation hardness (see [table III](#) and [table V](#)). Upon qualification, manufacturers shall provide the verification test conditions from section 5 of method 1080 of [MIL-STD-750](#) that were used to qualify the device for inclusion into section 6 of the slash sheet. End-point measurements shall be in accordance with [table II](#). SEE (SEB/SEGR) characterization data shall be made available upon request of the qualifying or acquiring activity.

4.2.1.2 Lead or carrier attach. For devices that include a lead or carrier attach package configuration qualification shall be performed in accordance with [table IV](#) herein, at initial qualification and after process or design changes.

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4.3 Screening (JANS and JANTXV). Screening shall be in accordance with table E-IV of MIL-PRF-19500, and as specified herein. The following measurements shall be made in accordance with table I herein. Devices that exceed the limits of table I herein shall not be acceptable.

Screen (see table E-IV of MIL-PRF-19500) (1) (2)	Measurement	
	JANS level	JANTXV levels
(3)	Gate stress test (see 4.3.1)	Gate stress test (see 4.3.1)
(3)	Method 3470 of MIL-STD-750, E _{AS} (see 4.3.2)	Method 3470 of MIL-STD-750, E _{AS} (see 4.3.2)
(3) 3c	Method 3161 of MIL-STD-750, thermal impedance, (see 4.3.3)	Method 3161 of MIL-STD-750, thermal impedance, (see 4.3.3)
5	Method 2052 of MIL-STD-750, PIND (see MIL-PRF-19500 and 4.3.5)	Not applicable
9	Subgroup 2 of table I herein,	Not applicable
10	Method 1042 of MIL-STD-750, test condition B	Method 1042 of MIL-STD-750, test condition B
11	Subgroup 2 of table I herein $\Delta I_{GSSF1} = \pm 20$ nA dc or ± 100 percent of initial value, whichever is greater. $\Delta I_{GSSR1} = \pm 20$ nA dc or ± 100 percent of initial value, whichever is greater. $\Delta I_{DSS1} = \pm 10$ μ A dc or ± 100 percent of initial value, whichever is greater.	Subgroup 2 of table I herein
12	MIL-STD-750, method 1042, test condition A	MIL-STD-750, method 1042, test condition A
13	Subgroups 2 and 3 of table I herein $\Delta I_{GSSF1} = \pm 20$ nA dc or ± 100 percent of initial value, whichever is greater. $\Delta I_{GSSR1} = \pm 20$ nA dc or ± 100 percent of initial value, whichever is greater. $\Delta I_{DSS1} = \pm 10$ μ A dc or ± 100 percent of initial value, whichever is greater. $\Delta r_{DS(on)1} = \pm 20$ percent of initial value $\Delta V_{GS(th)1} = \pm 20$ percent of initial value	Subgroups 2 and 3 of table I herein $\Delta I_{GSSF1} = \pm 20$ nA dc or ± 100 percent of initial value, whichever is greater. $\Delta I_{GSSR1} = \pm 20$ nA dc or ± 100 percent of initial value, whichever is greater. $\Delta I_{DSS1} = \pm 10$ μ A dc or ± 100 percent of initial value, whichever is greater. $\Delta r_{DS(on)1} = \pm 20$ percent of initial value $\Delta V_{GS(th)1} = \pm 20$ percent of initial value

- (1) At the end of the test program, I_{GSSF1} , I_{GSSR1} , and I_{DSS1} are measured.
- (2) An out-of-family program to characterize I_{GSSF1} , I_{GSSR1} , I_{DSS1} , $V_{GS(th)1}$, and $r_{DS(on)1}$ shall be invoked.
- (3) Shall be performed anytime after temperature cycling, screen 3a; JANTXV level does not need to be repeated in screening requirements.

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4.3.1 Gate stress test. Apply $V_{GS} = 24$ V, minimum for $t = 250$ μ S, minimum.

4.3.2 Single pulse avalanche energy (E_{AS}).

- a. Peak current $I_{AS} = I_{D1}$.
- b. Inductance $L = \left[\frac{2E_{AS}}{(I_{D1})^2} \right] \left[\frac{V_{BR} - V_{DD}}{V_{BR}} \right]$ mH minimum.
- c. Gate to source resistor R_{GS} $25 \Omega \leq R_{GS} \leq 200 \Omega$.
- d. Supply voltage $V_{DD} = 25$ V dc, except $V_{DD} = 50$ V dc for 2N7469U2.
- e. Initial case temperature $T_C = +25^\circ$ C, -5° C, $+10^\circ$ C.
- f. Gate voltage $V_{GS} = 12$ V dc.
- g. Number of pulses to be applied 1 pulse minimum.

4.3.3 Thermal impedance. The thermal impedance measurements shall be performed in accordance with method 3161 of [MIL-STD-750](#) using the guidelines in that method for determining I_M , I_H , t_H , t_{MD} , t_{SW} , (and V_H where appropriate). See [table III](#), group E, subgroup 4 herein.

4.3.4 Lead or carrier attach screening (All quality levels). All surface mount devices with added leads or carrier boards shall be screened as specified herein.

Screen	MIL-STD-750 Method	Conditions
1. Hermetic Seal <u>1/</u> a. Fine Leak b. Gross Leak	1071	
2. Thermal Response (see 4.3.3) A2 dc Electrical <u>2/ 3/</u>	3161	Read and Record.
3. X-Radiography	2076	The solder material coverage at the package lead pad/SMD carrier sub interfaces shall be 85% minimum
4. External Visual Examination	2071	Cracks or separation of materials shall not be evident on any device after the SMD lead attach assembly operation. Pad and Isolation areas shall be free from foreign matter and extraneous solder. Solder fillet coverage at the lead/package lead pad interfaces, along all visible sides, minimum of 75% solder fillet coverage.
5a. Physical dimensions	2066	6 piece sample, each device shall meet the requirements specified on figure 2 and 3 .
5b. Terminal Strength	2036	3 piece sample.

1/ Evaluation of surface sorption in accordance with method 1071 shall be performed.

2/ Only DC electrical test specified herein.

3/ When lead carrier bend is requested, the electrical test is performed prior to the bend process

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4.3.5 PIND. Not applicable in screening when devices are processed using alternative method and flow requirements approved by the qualifying activity, that includes incorporating the use of certified clean processing and silicone die coat. Instead, the PIND test performance shall be performed in group B3 and group C3, on a lot sample basis. PIND failures detected in group B or C will represent lot jeopardy and shall be evaluated for root cause and lot integrity.

4.4 Conformance inspection. Conformance inspection shall be in accordance with [MIL-PRF-19500](#). Alternate flow is allowed for conformance inspection in accordance with figure 4 of [MIL-PRF-19500](#).

4.4.1 Group A inspection. Group A inspection shall be conducted in accordance with table E-V of [MIL-PRF-19500](#) and [table I](#) herein.

4.4.2 Group B inspection. Group B inspection shall be conducted in accordance with the conditions specified for subgroup testing in table E-VIA (JANS) and table E-VIB (JANTXV) of [MIL-PRF-19500](#), and as follows.

4.4.2.1 Quality level JANS, table E-VIA of [MIL-PRF-19500](#).

<u>Subgroup</u>	<u>Method</u>	<u>Condition</u>
B3	1051	Test condition G, 100 cycles.
B3	2077	SEM.
B3	2052	PIND, required if not performed in screening. (22 devices, c = 0 for large lots, 12 devices, c = 0 for small lots).
B4	1042	Intermittent operation life, condition D. No heat sink or forced-air cooling on the device shall be permitted during the on cycle. $t_{on} = 30$ seconds minimum.
B5	1042	Accelerated steady-state gate bias, condition B, $V_{GS} = \text{rated}$; $T_A = +175^\circ\text{C}$, $t = 24$ hours minimum; or $T_A = +150^\circ\text{C}$, $t = 48$ hours minimum.
B5	1042	Accelerated steady-state reverse bias, condition A, $V_{DS} = \text{rated}$; $T_A = +175^\circ\text{C}$, $t = 120$ hours minimum; or $T_A = +150^\circ\text{C}$, $t = 240$ hours minimum.
B5	2037	Bond strength, test condition A.

4.4.2.2 Quality level JANTXV, table E-VIB of [MIL-PRF-19500](#).

<u>Subgroup</u>	<u>Method</u>	<u>Condition</u>
B2	1051	Test condition G, 25 cycles.
B3	1042	Intermittent operation life, condition D. No heat sink or forced-air cooling on the device shall be permitted during the on cycle. $t_{on} = 30$ seconds minimum.
B5 and B6		Not applicable.

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4.4.3 Group C inspection. Group C inspection shall be conducted in accordance with the conditions specified for subgroup testing in table E-VII of [MIL-PRF-19500](#) and as follows.

<u>Subgroup</u>	<u>Method</u>	<u>Condition</u>
C2	2036	Terminal strength is not applicable.
C3	2052	PIND, required if not performed in screening. (22 devices, c = 0 for large lots, 12 devices, c = 0 for small lots).
C5	3161	Thermal resistance, see 4.3.3 .
C6	1042	Intermittent operation life, condition D. No heat sink or forced-air cooling on the device shall be permitted during the on cycle. $t_{on} = 30$ seconds minimum.

4.4.4 Group D inspection. Group D inspection shall be conducted in accordance with table E-VIII of [MIL-PRF-19500](#) and [table II](#) herein.

4.4.5 Group E inspection. Group E inspection shall be conducted in accordance with the conditions specified for subgroup testing in table E-IX of [MIL-PRF-19500](#) and as specified in [table III](#) and [IV](#) herein.

4.5 Methods of inspection. Methods of inspection shall be as specified in the appropriate tables and as follows.

4.5.1 Pulse measurements. Conditions for pulse measurement shall be as specified in section 4 of [MIL-STD-750](#).

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TABLE I. Group A inspection.

Inspection <u>1/ 2/</u>	MIL-STD-750		Symbol	Limits		Unit
	Method	Condition		Min	Max	
<u>Subgroup 1</u>						
Visual and mechanical inspection	2071					
<u>Subgroup 2</u>						
Thermal impedance <u>3/</u>	3161	See 4.3.3	$Z_{\theta JC}$			°C/W
Breakdown voltage drain to source 2N7468U2 2N7469U2	3407	$V_{GS} = 0$, $I_D = 1$ mA dc, bias condition C	$V_{(BR)DSS}$	60 100		V dc V dc
Gate to source voltage (threshold)	3403	$V_{DS} \geq V_{GS}$, $I_D = 1$ mA dc	$V_{GS(TH)1}$	2.0	4.0	V dc
Gate current	3411	$V_{GS} = +20$ V dc, bias condition C, $V_{DS} = 0$	I_{GSSF1}		+100	nA dc
Gate current	3411	$V_{GS} = -20$ V dc, bias condition C, $V_{DS} = 0$	I_{GSSR1}		-100	nA dc
Drain current	3413	$V_{GS} = 0$, bias condition C, $V_{DS} = 80$ percent of rated V_{DS} ,	I_{DSS1}		10	μA dc
Static drain to source on-state resistance 2N7468U2 2N7469U2	3421	$V_{GS} = 12$ V dc, condition A, pulsed (see 4.5.1), $I_D = I_{D2}$	$r_{DS(ON)1}$		0.0056 0.012	Ω Ω
Forward voltage 2N7468U2 2N7469U2	4011	$V_{GS} = 0$, condition A, $I_D = I_{D2}$	V_{SD}		1.3 1.2	V dc V dc

See footnotes at end of table.

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TABLE I. Group A inspection – Continued.

Inspection <u>1/</u>	MIL-STD-750		Symbol	Limits		Unit
	Method	Condition		Min	Max	
<u>Subgroup 3</u>						
High temperature operation		$T_C = T_J = +125^\circ\text{C}$				
Gate current	3411	$V_{GS} = \pm 20\text{ V dc}$, bias condition C, $V_{DS} = 0$	I_{GSS2}		± 200	nA dc
Drain current	3413	$V_{GS} = 0$, bias condition C, $V_{DS} = 80$ percent of rated V_{DS}	I_{DSS2}		25	$\mu\text{A dc}$
Static drain to source on-state resistance 2N7468U2 2N7469U2	3421	$V_{GS} = 12\text{ V dc}$, condition A, pulsed (see 4.5.1), $I_D = I_{D2}$	$r_{DS(ON)3}$		0.011 0.020	Ω Ω
Gate to source voltage (threshold)	3403	$V_{DS} \geq V_{GS}$, $I_D = 1\text{ mA dc}$	$V_{GS(TH)2}$	1.0		V dc
Low temperature operation		$T_C = T_J = -55^\circ\text{C}$				
Gate to source voltage (threshold)	3403	$V_{DS} \geq V_{GS(TH)3}$, $I_D = 1\text{ mA dc}$	$V_{GS(TH)3}$		5.0	V dc
<u>Subgroup 4</u>						
Forward transconductance 2N7468U2 2N7469U2	3475	$I_D = I_{D2}$, $V_{DD} = 15\text{ V dc}$ (see 4.5.1)	g_{FS}	45 42		S S
Switching time test	3472	$I_D = 45\text{ A}$, $V_{GS} = 12\text{ V dc}$, $R_G = 2.35\ \Omega$, $V_{DD} = 50$ percent of rated V_{DS}				
Turn-on delay time 2N7468U2 2N7469U2			$t_{D(on)}$		35 35	ns ns
Rise time 2N7468U2 2N7469U2			t_r		125 125	ns ns
Turn-off delay time 2N7468U2 2N7469U2			$t_{D(off)}$		69 75	ns ns
Fall time 2N7468U2 2N7469U2			t_f		50 50	ns ns

See footnotes at end of table.

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TABLE I. Group A inspection - Continued.

Inspection ^{1/}	MIL-STD-750		Symbol	Limits		Unit
	Method	Condition		Min	Max	
<u>Subgroup 5</u>						
Safe operating area test (high voltage)	3474	See figures 7 and 8 $t_p = 10$ ms min. $V_{DS} = 80$ percent of max. rated V_{DS}				
Electrical measurements		See table I, subgroup 2				
<u>Subgroup 6</u>						
Not applicable						
<u>Subgroup 7</u>						
Gate charge	3471	Condition B, $I_D = 45$ A, $V_{GS} = 12$ V dc, $V_{DD} = 50$ percent of rated V_{DS}				
On-state gate charge 2N7468U2			$Q_{G(ON)}$		165	nC
2N7469U2					160	nC
Gate to source charge 2N7468U2			Q_{GS}		55	nC
2N7469U2					55	nC
Gate to drain charge 2N7468U2			Q_{GD}		65	nC
2N7469U2					65	nC
Reverse recovery time	3473	$di/dt = -100$ A/ μ s, $V_{DD} \leq 50$ V, $I_D = 45$ A., condition A	t_{rr}			
2N7468U2					200	ns
2N7469U2					300	ns

^{1/} For sampling plan, see MIL-PRF-19500.

^{2/} Electrical characteristics for the "U2A", "U2L", and "U2S" suffix devices are identical to the "U2" suffix devices unless otherwise noted.

^{3/} For end-point measurements, this test is required for the following subgroups:
Group B, subgroups 3 and 4 (JANS).
Group B, subgroups 2 and 3 (JANTXV).
Group C, subgroup 2 and 6.
Group E, subgroup 1.

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TABLE II. Group D inspection.

Inspection 1/ 2/ 3/ 4/	MIL-STD-750		Symbol	Pre-irradiation limits		Post-irradiation limits				Unit
	Method	Conditions		R, F, G and H		R, F and G		H 5/		
				Min	Max	Min	Max	Min	Max	
<u>Subgroup 1</u>										
Not applicable										
<u>Subgroup 2</u>		$T_C = +25^\circ\text{C}$								
* Steady-state total dose irradiation (V_{GS} bias) 6/	1019	Condition A, $V_{GS} = 12\text{ V};$ $V_{DS} = 0$								
* Steady-state total dose irradiation (V_{DS} bias) 6/	1019	Condition A, $V_{GS} = 0;$ $V_{DS} = 80$ percent of rated V_{DS} (pre-irradiation)								
End-point electricals										
Breakdown voltage, drain to source 2N7468U2 2N7469U2	3407	$V_{GS} = 0; I_D = 1\text{ mA};$ bias condition C	$V_{(BR)DS}$	60 100		60 100		60 100		V dc V dc
Gate to source voltage (threshold) 2N7468U2 2N7469U2	3403	$V_{DS} \geq V_{GS}$ $I_D = 1\text{ mA}$	$V_{GS(th)1}$	2.0 2.0	4.0 4.0	2.0 2.0	4.0 4.0	1.5 1.5	4.0 4.0	V dc V dc
Gate current	3411	$V_{GS} = +20\text{ V}; V_{DS} = 0$ bias condition C	I_{GSSF1}		100		100		100	nA dc
Gate current	3411	$V_{GS} = -20\text{ V}; V_{DS} = 0$ bias condition C	I_{GSSR1}		-100		-100		-100	nA dc
Drain current	3413	$V_{GS} = 0$ $V_{DS} = 80$ percent of rated V_{DS} (pre-irradiation); bias condition C	I_{DSS}		10		10		25	μA dc
Static drain to source on-state voltage 2N7468U2 2N7469U2	3405	$V_{GS} = 12\text{ V}; I_D = 45\text{ A},$ condition A; pulsed (see 4.5.1)	$V_{DS(on)}$		0.275 0.585		0.275 0.585		0.320 0.630	V dc V dc
Forward voltage source drain diode 2N7468U2 2N7469U2	4011	$V_{GS} = 0; I_D = 45\text{ A},$ bias condition A	V_{SD}		1.3 1.2		1.3 1.2		1.3 1.2	V dc V dc

- 1/ For sampling plan see [MIL-PRF-19500](#).
- 2/ Group D qualification may be performed prior to lot formation. Wafers qualified to these group D QCI requirements may be used for any other specification sheets utilizing the same die design.
- 3/ At the manufacturer's option, group D samples need not be subjected to the screening tests, and may be assembled in it's qualified package or in any qualified package that the manufacturer has data to correlate the performance to the designated package.
- 4/ Electrical characteristics for the "U2A", "U2L", and "U2S" suffix devices are identical to the "U2" suffix devices unless otherwise noted.
- 5/ The H designation represents devices which pass endpoints at all 100K, 300K and 600K rads (Si).
- 6/ Separate samples shall be pulled for each bias.

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TABLE III. Group E inspection (all quality levels) for qualification or re-qualification only.

Inspection	MIL-STD-750		Qualification and large lot quality conformance inspection
	Method	Conditions	
<u>Subgroup 1</u>			45 devices c = 0
Temperature cycling	1051	Test condition G, 500 cycles	
Hermetic seal Fine leak Gross leak	1071		
Electrical measurements		Table I, subgroup 2 herein.	
<u>Subgroup 2 1/</u>			45 devices c = 0
Steady-state gate bias	1042	Condition B, 1,000 hours.	
Electrical measurements		Table I, subgroup 2 herein.	
Steady-state reverse bias	1042	Condition A, 1,000 hours.	
Electrical measurements		Table I, subgroup 2 herein.	
<u>Subgroup 4</u>			Sample size N/A
Thermal impedance curves		See MIL-PRF-19500.	
<u>Subgroup 5</u>			
Not applicable			
<u>Subgroup 10</u>			22 devices c = 0
Commutating diode for safe operating area test procedure for measuring dv/dt during reverse recovery of power MOSFET transistors or insulated gate bipolar transistors	3476	Test conditions shall be derived by the manufacturer	
<u>Subgroup 11</u>			3 devices
SEE 2/ 3/	1080	See MIL-STD-750 method 1080 and 6.2.	

1/ A separate sample for each test shall be pulled.

2/ Group E qualification of SEE effect testing may be performed prior to lot formation. Qualification may be extended to other specification sheets utilizing the same structurally identical die design.

3/ Device qualification to a higher level Linear energy transfer (LET) is sufficient to qualify all lower level LETs.

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TABLE IV. Lead alternation qualification inspection requirements.

Inspections <u>1/</u>	MIL-STD-750		Sample size
	Method	Conditions	
<u>Subgroup 1</u>			
Temperature cycle	1051	100 Temp cycles, test condition G or maximum storage temperature.	6 devices, c = 0
Hermetic seal Fine leak Gross leak	1071		
A2 dc electrical		Read and record.	
Thermal response	3161		
External visual examination	2071	Cracks or separation of materials shall not be evident on test samples.	
<u>Subgroup 2</u>			
Intermittent operating life	1042	Condition D; 6,000 cycles.	6 devices, c = 0
A2 dc electrical		Read and record.	
Thermal response	3161		
External visual examination	2071	Cracks or separation of materials shall not be evident on test samples.	
<u>Subgroup 3</u>			
Terminal strength	2036	Tension; Condition A 10lbs for 10 seconds Fatigue; Condition E 3 arcs of 90 +/-5 degrees each 8.0 oz.	6 devices, c = 0
A2 dc electrical		Read and record.	
External visual examination	2071	Cracks or separation of materials shall not be evident on test samples.	

1/ Qualification samples performed on non-formed leaded devices.

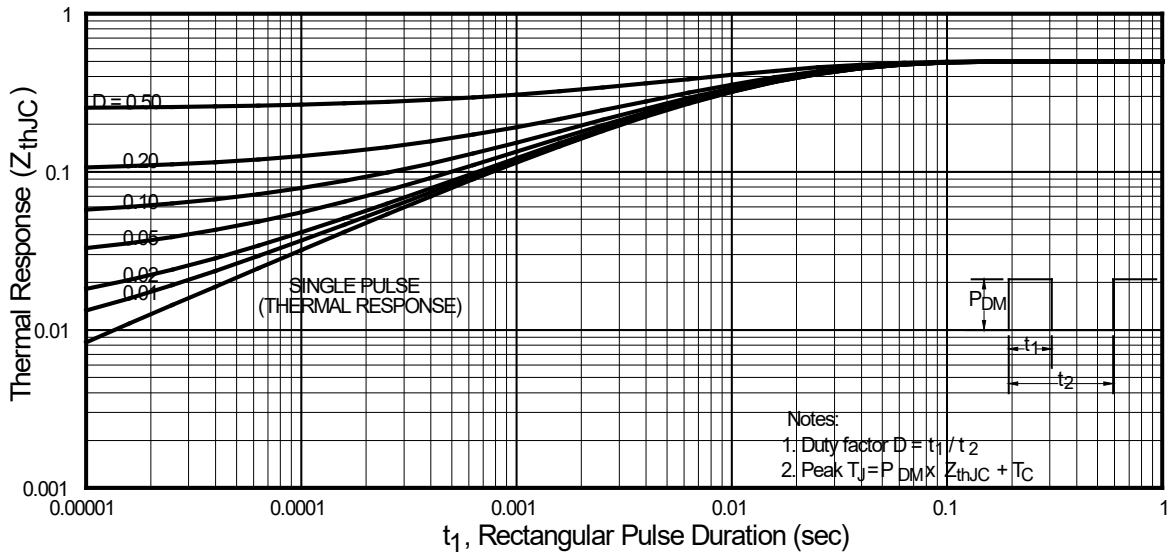
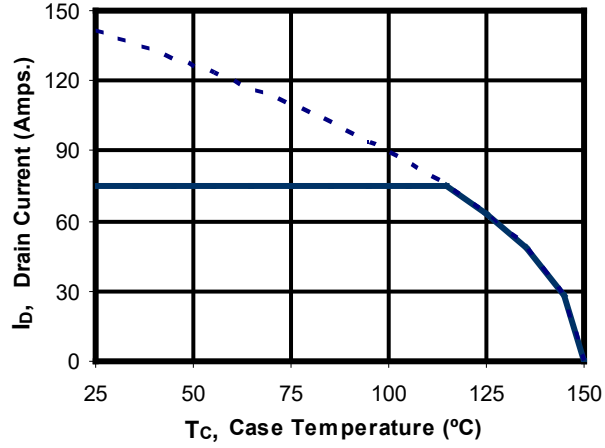


FIGURE 5. Thermal response curve.

2N7468U2, U2A, U2L, U2S

Maximum Current Rating



2N7469U2, U2A, U2L, U2S

Maximum Current Rating

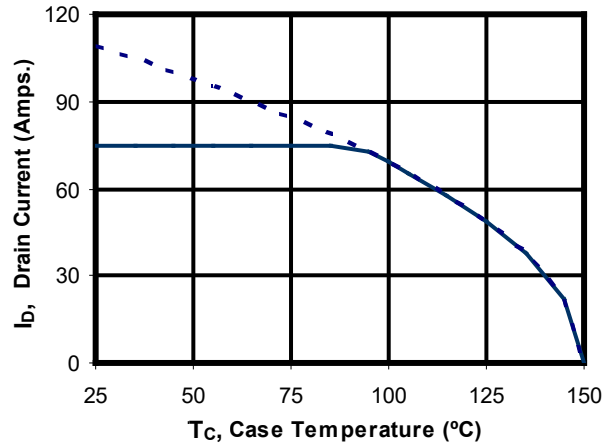
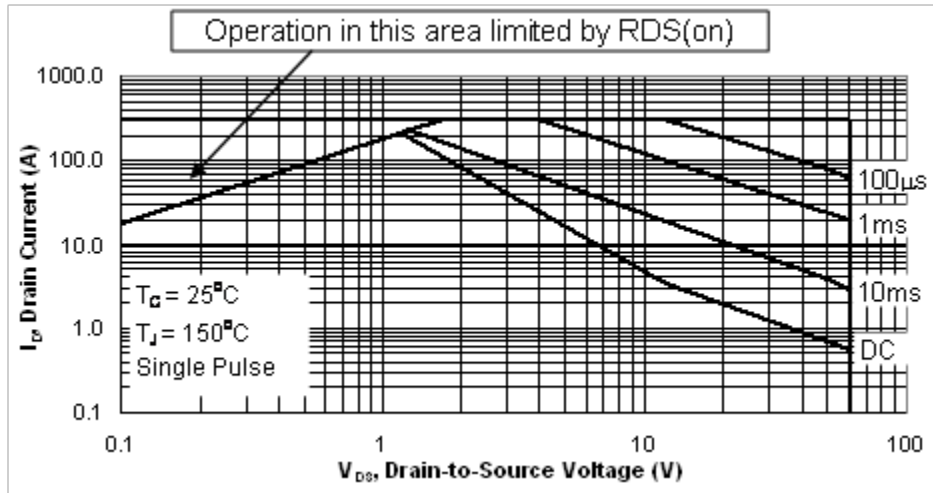
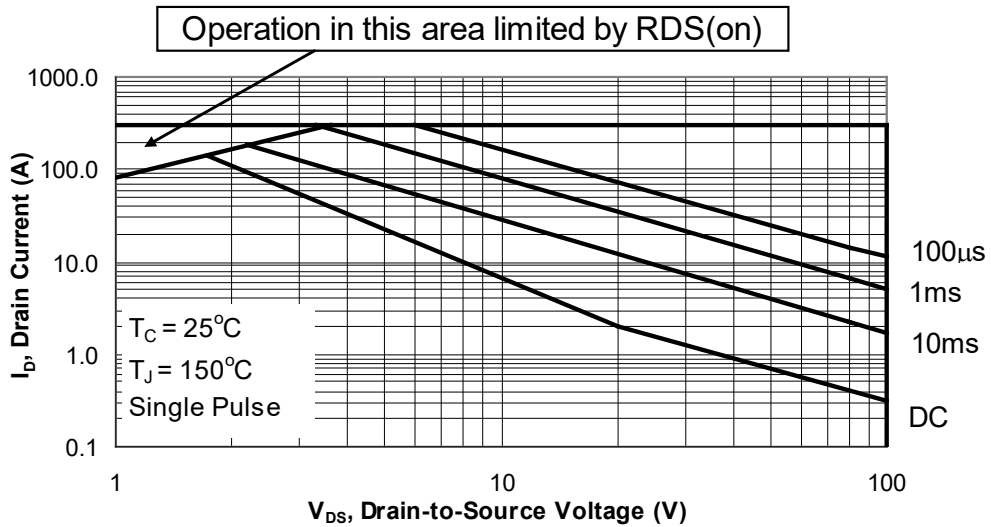


FIGURE 6. Maximum drain current versus case temperature graphs.



2N7468U2, U2A, U2L, U2S

FIGURE 7. Safe operating area graph.



2N7469U2, U2A, U2L, U2S

FIGURE 8. Safe operating area graph.

*

5. PACKAGING

5.1 Packaging. For acquisition purposes, the packaging requirements shall be as specified in the contract or order (see 6.2). When packaging of materiel is to be performed by DoD or in-house contractor personnel, these personnel need to contact the responsible packaging activity to ascertain packaging requirements. Packaging requirements are maintained by the Inventory Control Point's packaging activities within the Military Service or Defense Agency, or within the Military Service's system commands. Packaging data retrieval is available from the managing Military Department's or Defense Agency's automated packaging files, CD-ROM products, or by contacting the responsible packaging activity.

6. NOTES

(This section contains information of a general or explanatory nature that may be helpful, but is not mandatory. The notes specified in [MIL-PRF-19500](#) are applicable to this specification.)

6.1 Intended use. Semiconductors conforming to this specification are intended for original equipment design applications and logistic support of existing equipment.

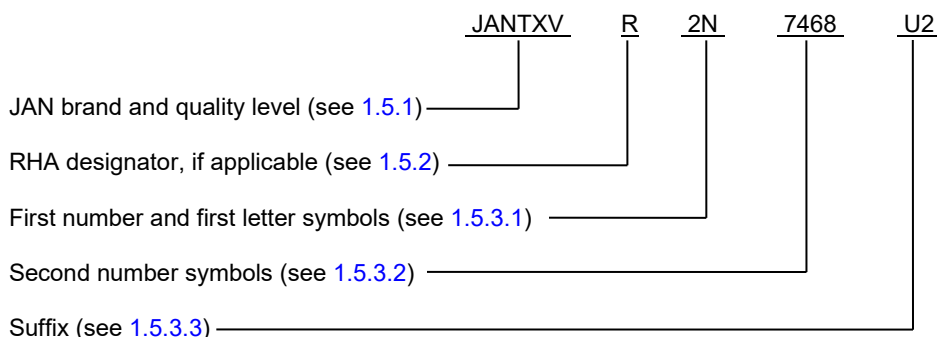
6.2 Acquisition requirements. Acquisition documents should specify the following:

- a. Title, number, and date of this specification.
- b. Packaging requirements (see 5.1).
- c. Terminal material and finish (see 3.4.1).
- d. The complete PIN, see 1.5 and 6.4.
- e. For acquisition of RHA designated devices, [table II](#), subgroup 1 testing of group D herein is optional. If subgroup 1 is desired, it should be specified in the contract.
- f. If specific SEE characterization conditions are desired (see section 6.7 and [table V](#)), manufacturer's cage code should be specified in the contract or order.
- g. If SEE testing data is desired, it should be specified in the contract or order.
- h. If the leaded or carrier board configuration is desired for U2 suffix devices (see 3.4.3), it should be specified in the contract. For acquisition of U2 suffix devices, the default configuration is delivered without the carrier board.

6.3 Qualification. With respect to products requiring qualification, awards will be made only for products which are, at the time of award of contract, qualified for inclusion in Qualified Manufacturers List (QML 19500) whether or not such products have actually been so listed by that date. The attention of the contractors is called to these requirements, and manufacturers are urged to arrange to have the products that they propose to offer to the Federal Government tested for qualification in order that they may be eligible to be awarded contracts or orders for the products covered by this specification. Information pertaining to qualification of products may be obtained from DLA Land and Maritime, ATTN: VQE, P.O. Box 3990, Columbus, OH 43218-3990 or e-mail vqe.chief@dla.mil. An online listing of products qualified to this specification may be found in the Qualified Products Database (QPD) at <https://qpldocs.dla.mil>.

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6.4 PIN construction example. The PINs for encapsulated devices are constructed using the following form.



6.5 List of PINs. The following is a list of possible PINs available on this specification sheet.

PINs for devices of the "TXV" quality level	PINs for devices of the "TXV" quality level with RHA (1)	PINs for devices of the "S" quality level	PINs for devices of the "S" quality level with RHA (1)
JANTXV2N7468U2	JANTXV#2N7468U2	JANS2N7468U2	JANS#2N7468U2
JANTXV2N7468U2A	JANTXV#2N7468U2A	JANS2N7468U2A	JANS#2N7468U2A
JANTXV2N7468U2L	JANTXV#2N7468U2L	JANS2N7468U2L	JANS#2N7468U2L
JANTXV2N7468U2S	JANTXV#2N7468U2S	JANS2N7468U2S	JANS#2N7468U2S
JANTXV2N7469U2	JANTXV#2N7469U2	JANS2N7469U2	JANS#2N7469U2
JANTXV2N7469U2A	JANTXV#2N7469U2A	JANS2N7469U2A	JANS#2N7469U2A
JANTXV2N7469U2L	JANTXV#2N7469U2L	JANS2N7469U2L	JANS#2N7469U2L
JANTXV2N7469U2S	JANTXV#2N7469U2S	JANS2N7469U2S	JANS#2N7469U2S

(1) The number sign (#) represents one of four RHA designators available (R, F, G, or H).

6.6 Substitution information. The following table shows the generic P/N and its associated military P/N (without JAN and RHA prefix).

Generic P/N	Military P/N
IRHNA57064	2N7468U2
IRHNA57160	2N7469U2
IRHNS57064	2N7468U2A
IRHNS57160	2N7469U2A

6.7 Application data.

* 6.7.1 Manufacturer specific irradiation data. Each manufacturer qualified to this specification sheet has characterized its devices to the requirements of MIL-STD-750 method 1080 and as specified herein. Since each manufacturer's characterization conditions can be different and can vary by the version of method 1080 qualified to, the MIL-STD-750 method 1080 revision version date and conditions used by each manufacturer for characterization have been listed here (see table V) for information only. SEE (SEB and SEGR) conditions and figures listed in section 6 are current as of the date of this specification sheet, please contact the manufacturer for the most recent conditions.

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TABLE V. Manufacturers characterization conditions.

Manufactures cage	Inspection	MIL-STD-750		Sample plan
		Method	Conditions	
* 69210 (Applicable to devices with a date code of 21 August 2012 and older)	SEE <u>1/</u> Electrical measurements	1080.0	See MIL-STD-750E method 1080.0 dated 20 November 2006. See figure 9 I_{GSSF1} , I_{GSSR1} , and I_{DSS1} in accordance with table I, subgroup 2	3 devices
* 2N7468U2, U2A, U2A, U2L, U2S	SEE irradiation:		Fluence = $3E5 \pm 20$ percent ions/cm ² Flux = $2E3$ to $2E4$ ions/cm ² /sec, temperature = $25^\circ \pm 5^\circ C$ Surface LET = $38 \text{ MeV-cm}^2/\text{mg} \pm 5\%$, range = $38 \mu\text{m} \pm 7.5\%$, Br ion energy = $300 \text{ MeV} \pm 7.5\%$ In-situ bias conditions: $V_{DS} = 60 \text{ V}$ and $V_{GS} = -15 \text{ V}$ $V_{DS} = 30 \text{ V}$ and $V_{GS} = -20 \text{ V}$ (nominal 3.80 MeV/Nucleon at Brookhaven National Lab Accelerator)	
* 2N7469U2, U2A, U2L, U2S			In-situ bias conditions: $V_{DS} = 100 \text{ V}$ and $V_{GS} = -20 \text{ V}$ (nominal 3.80 MeV/nucleon at Brookhaven National Lab Accelerator)	
* 2N7468U2, U2A, U2L, U2S			Surface LET = $61 \text{ MeV-cm}^2/\text{mg} \pm 5\%$, range = $31 \mu\text{m} \pm 10\%$, I ion energy = $330 \text{ MeV} \pm 7.5\%$ In-situ bias conditions: $V_{DS} = 46 \text{ V}$ and $V_{GS} = -5 \text{ V}$ $V_{DS} = 35 \text{ V}$ and $V_{GS} = -10 \text{ V}$ $V_{DS} = 25 \text{ V}$ and $V_{GS} = -15 \text{ V}$ $V_{DS} = 15 \text{ V}$ and $V_{GS} = -20 \text{ V}$ (nominal 2.60 MeV/nucleon at Brookhaven National Lab Accelerator)	
	2N7469U2, U2A, U2L, U2S		In-situ bias conditions: $V_{DS} = 100 \text{ V}$ and $V_{GS} = -10 \text{ V}$ $V_{DS} = 35 \text{ V}$ and $V_{GS} = -15 \text{ V}$ $V_{DS} = 25 \text{ V}$ and $V_{GS} = -20 \text{ V}$ (nominal 2.60 MeV/nucleon at Brookhaven National Lab Accelerator)	

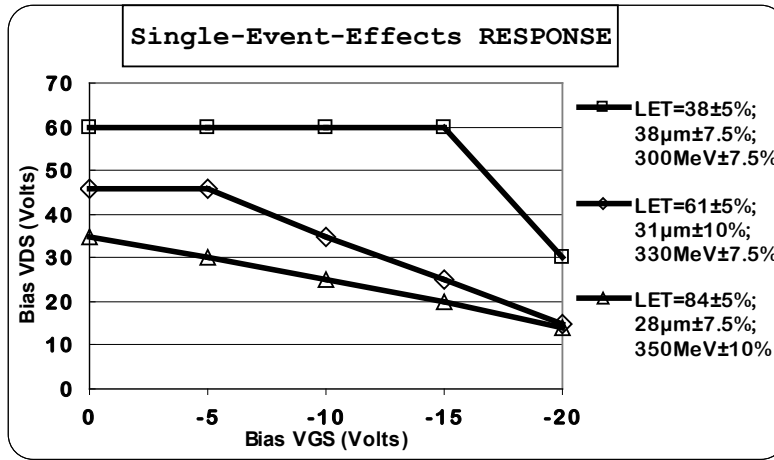
See footnotes at end of table.

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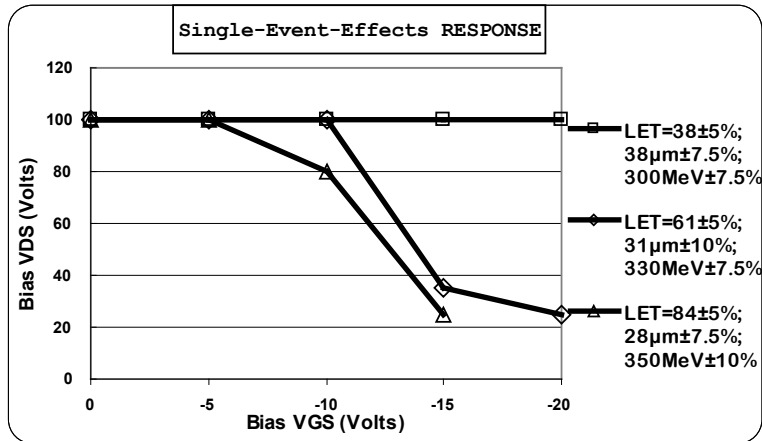
TABLE V. Manufacturers characterization conditions - Continued.

Manufactures cage	Inspection	MIL-STD-750		Sample plan
		Method	Conditions	
*	2N7468U2, U2A, U2L, U2S		Surface LET = 84 MeV-cm ² /mg ±5%, range = 28 μm ±7.5%, Au ion energy = 350 MeV ±10% In-situ bias conditions: V _{DS} = 35 V and V _{GS} = 0 V V _{DS} = 30 V and V _{GS} = -5 V V _{DS} = 25 V and V _{GS} = -10 V V _{DS} = 20 V and V _{GS} = -15 V V _{DS} = 14 V and V _{GS} = -20 V (nominal 1.78 MeV/nucleon at Brookhaven National Lab Accelerator)	
	2N7469U2, U2A, U2L, U2S		In-situ bias conditions: V _{DS} = 100 V and V _{GS} = -5 V V _{DS} = 80 V and V _{GS} = -10 V V _{DS} = 25 V and V _{GS} = -15 V (nominal 1.78 MeV/nucleon at Brookhaven National Lab Accelerator)	
	Electrical measurements		I _{GSSF1} , I _{GSSR1} , and I _{DSS1} in accordance with table 1 , subgroup 2	
<div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 0 auto;"> <p>Upon qualification, all manufacturers should provide the verification test conditions to be added to this table.</p> </div>				

^{1/} I_{GSSF1}, I_{GSSR1}, and I_{DSS1} was examined before and following SEE irradiation to determine acceptability for each bias condition. Other test conditions in accordance with [table 1](#), subgroup 2, may be performed at the manufacturer's option.



2N7468U2, U2A, U2L, U2S



2N7469U2, U2A, U2L, U2S

FIGURE 9. Typical SEE safe operating area graphs.

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6.8 Request for new types and configurations. Requests for new device types or configurations for inclusions in this specification sheet should be submitted to: DLA Land and Maritime, ATTN: VAC, Post Office Box 3990, Columbus, OH 43218-3990 or by electronic mail at Semiconductor@dla.mil or by facsimile (614) 693-1642 or DSN 850-6939.

6.9 Amendment notations. The margins of this specification are marked with asterisks to indicate modifications generated by this amendment. This was done as a convenience only and the Government assumes no liability whatsoever for any inaccuracies in these notations. Bidders and contractors are cautioned to evaluate the requirements of this document based on the entire content irrespective of the marginal notations.

Custodians:

Army - CR
* Navy - SH
Air Force - 85
NASA - NA
DLA - CC

Preparing activity:
DLA - CC

(Project 5961-2021-076)

Review activities:

Army - MI
Air Force - 19, 71

NOTE: The activities listed above were interested in this document as of the date of this document. Since organizations and responsibilities can change, you should verify the currency of the information above using the ASSIST Online database at <https://assist.dla.mil>.